6. Draw the shear force and bending moment diagram for the beam shown in Fig. 4 : **10**
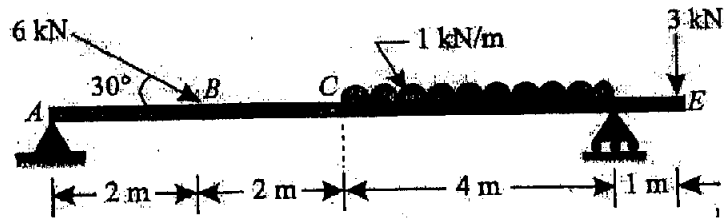

Fig. 4

Section D

7. Define rectilinear motion. The motion of a particle moving along a straight line is expressed as, $x = t^3 - 13.8t^2 + 39.92t - 19.2$ where x is in metres and t in seconds. **10**

   (i) Plot motion curves from $t = 0$ to $t = 5$s with $\Delta t = 1$s

   (ii) Find x, v, a when $t = 0$

   (iii) Find x, a when $v = 0$.

8. State and explain D'Alembert's principle. A life has an upward acceleration of 2.5 m/s². What pressure will a man of weight 800 N exert on a floor of the

July-22-00198

B. Tech. EXAMINATION, 2022

Semester I (CBCS)

ENGINEERING MECHANICS

ME-101

Time : 3 Hours   *Maximum Marks : 60*

The candidates shall limit their answers precisely within the answer-book (40 pages) issued to them and no supplementary/continuation sheet will be issued.

Note : Attempt *Five* questions in all, selecting *one* question from each Sections A, B, C and D. Q. No. **9** is compulsory.

Section A

1. Determine the magnitude of the resultant force and its direction, measured counter-clockwise from the positive X-axis (Fig. 1). **10**
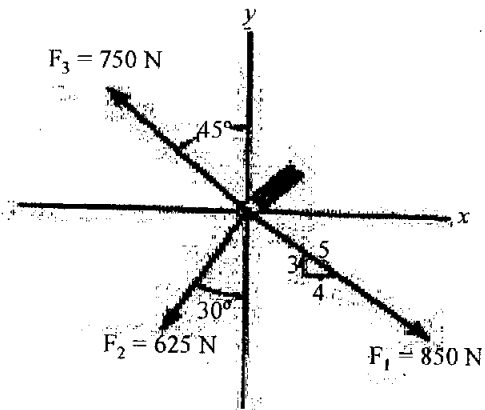
$F_3 = 750$ N

$45°$

y

x

$30°$

$F_2 = 625$ N

$F_1 = 850$ N

Fig. 1

2. State and derive the parallelogram law. Also discuss the law with special cases. **10**

Section B

3. Define Friction. State laws of friction. What is angle of friction, angle of repose and cone of friction ? Explain with examples. **10**

4. Find the centroid of the composite section. Also find moment of inertia of the section shown in Fig. 2 about horizontal and vertical axis through the centroid. **10**
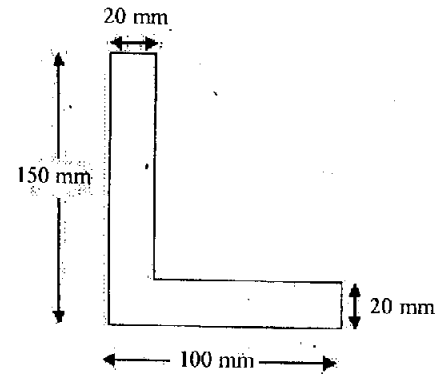
20 mm

150 mm

20 mm

100 mm

Fig. 2

Section C

5. Determine the forces in all the members of the frames shown in Fig. 3. Indicate the nature of the forces also. **10**

A

B

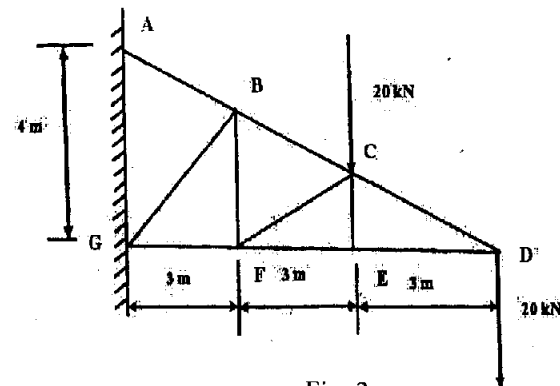20 kN

C

4 m

G

D

3 m   F 3 m   E 3 m

20 kN

Fig. 3

lift ? Determine the pressure he would exert if the lift has an acceleration of 2.5 m/s^2 downwards. Also determine the upward acceleration to cause the weight to exert a pressure of 1200 N on the floor. Assume $g = 9.81$ m/s^2. **4+6=10**

(Compulsory Question)

9. (a) Define Moment of a Force. Also give the SI units.

   (b) What are rigid bodies ? What are conditions of equilibrium for a rigid body ?

   (c) Define coefficient of static friction with its mathematical expression.

   (d) Define Triangle law of forces.

   (e) Differentiate between centroid and centre of gravity.

   (f) State the perpendicular axis theorem.

   (g) Explain the concept of friction with example.

   (h) State Polygon law of forces.

   (i) What is a fixed support and what are the reactions acting on a fixed support ?

   (j) List different types of beams with neat sketch.
   10×2=20